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Big Data and Analytics in the Enterprise

How to Improve Operations with Analytics
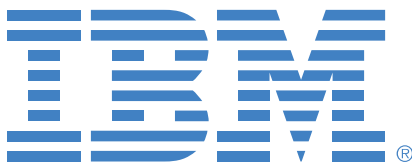
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As data centers become more complex, the need for real-time visibility gained through analyzing data across systems increases. Gaining control of the infrastructure environment improves system availability and energy efficiency, writes Blake Carlson of Emerson Network Power.

How Analyzing Big Data in the Data Center Can Boost Your Operations

by Blake Carlson

Blake Carlson *of Emerson Network Power*

Not only are data centers the place where today's companies store all the big data they are gathering and analyzing, they can also be a source of best practices for big data programs and analytics. Every piece of equipment and every action inside the data center creates data. The challenge is to be able to collect, aggregate and analyze real-time data so that it can provide the visibility needed to make critical business decisions.

Today's data center—whether it's for a global enterprise, a colocation company or cloud provider—supports more critical, interdependent devices and IT systems than ever before. This fact has increased the complexity of data center operations – and created the need for more sophisticated and automated approaches to manage the IT infrastructure.

As data centers have become more complex, the need for real-time visibility gained through the consolidating and analyzing data across systems has increased; it's not just about "big" data, but also "fast" data. Gaining control of the infrastructure environment leads to an optimized data center that improves system availability and energy efficiency.

The key to achieving these benefits is a data center infrastructure management (DCIM) platform. DCIM platforms provide data center managers with real-time, contextual, prioritized information that bridges the physical (equipment) and IT (applications) layers of the data center infrastructure.

This data helps data center managers to 1) see the current state of their facilities, 2) make data-driven decisions for how to operate and optimize their infrastructures and 3) take action and measure the effectiveness of those actions. By doing so, enterprise IT leaders can implement best practices—such as matching cooling capacity and airflow with IT loads and identifying and eliminating stranded capacity— and have the measurement data to demonstrate their benefit and effectiveness.

Previous-generation management systems for data centers simply didn't have the scale or sophistication to bring together the necessary data and convert it into a meaningful view of real-time operations. Current-generation systems have overcome this challenge through the use of dedicated appliances capable of consolidating data from across systems and the environment to provide a meaningful view of real-time operations.

Data Center Infrastructure Management, Then and Now

Issue	Old way of doing things	New way of doing things
Seeing the big picture	Calculations for data center metrics are collected manually and take days or weeks to assemble and report.	Intelligent equipment provides parametric data in real time. Reporting is scheduled or created ad-hoc.
Data center utilization	Requires multiple staffers–each one maintaining knowledge of a particular resource (such as cooling air/water and power supplies). Resources typically are oversized at the start. Maximizing utilization is complex due to buffering resource capacity to ensure sufficient resources.	Small staffing required due to automation. Actual utilization is compared to planned usage. New resources are added as needed based on maintaining a business-driven policy for resource overhead.
Data center capacity	Capacities are managed using custom tools and spreadsheets. Often lacks the scope to ensure capacities between resources are available and often results in stranded capacities, which could cause data center hotspots or equipment overheating.	Data on utilization of capacities is collected in real-time and evaluated against device manufacturers' stated maximums. Availability of resources is evaluated across all resources, reducing or eliminating stranded capacities.
Data center efficiency	Collection of data is manual or simply not available, resulting in old data or values lacking the fidelity to create quality efficiency metrics. Systems to collect power efficiency, water usage effectiveness, and carbon usage effectiveness are not integrated.	Data is collected in real-time and metrics provide at-the-moment understanding of data center efficiency. All efficiency metrics (such as power and water usage) are maintained in a common system. Changes in the data center environment are immediately evaluated in terms of efficiency.

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Implementing DCIM: Challenges and Benefits

As companies look to implement DCIM, there are a number of challenges that may need to be addressed. Three of the most common are:

1. System downtime. Implementing a DCIM system may involve some amount of downtime that impacts availability of the data center because the required infrastructure changes call for a high data quality level. Overcoming this challenge means planning for these changes to minimize any downtime.

2. Initial asset setup. To accurately track and manage data center equipment, each asset needs to be added to the system. Managing this transition can take time and divert staff away from other critical jobs.

3. Training and acceptance. A new DCIM system requires staff to be trained to adequately utilize the system. Training requires time, so enterprises need to plan for coverage; this can lead to staff being redirected while training occurs. Management also needs to communicate the importance of adopting DCIM as a critical element of the company's operational strategy.

By bringing together real-time information from across the data center, putting it into context and presenting it in ways that support effective decision making, DCIM frees data center managers to unify IT and facilities data to achieve a variety of objectives, including:

- Improved system availability by identifying dependencies and monitoring performance in real time, which enables insight into the impact of change, such as adding IT load or losing cooling supply. This step, when combined with automated alarm notification and analysis of system management trends, means enterprises can seek to maximize uptime without sacrificing efficiency.

- Greater energy efficiency through a comprehensive inventory of every asset's floor or rack position, including power and thermal profile, presented in a unified view of the data center that facilitates collaborative planning and enables lower operational expenses without sacrificing availability.

- Increased resource utilization through accurate insight into current usage, real-time, trend and historical change tracking and the ability to preview the impact of change before it is made.

Basically, implementing DCIM means that data center managers will be able to make better, more informed decisions on the management of the data center. For instance, data center managers needing to plan for growth can now support changes to the data

center without compromising availability, and while ensuring customers' needs and corporate goals are supported. Data center managers also have the consolidated data needed to provide vision and direction for the company and support initiatives, such as sustainability, while remaining within budget and reaching projected earnings per share.

Gaining advantage from big data is all about making fast decisions; not looking at old data and making decisions – rather looking at data now and making relevant decisions now that impact operations. This is what is happening today with the management of the data center infrastructure. The gathering and analysis of big data is supporting faster, better decisions with clear outcomes and measurements.

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Blake Carlson is vice president, global strategy and business development at Emerson Network Power. He manages the strategic direction for the Avocent business of Emerson Network Power, including both the Avocent and Aperture brands. The company is a unit of Emerson that delivers software, hardware and services that maximize availability, capacity and efficiency for data centers, healthcare and industrial facilities.

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Supply chain consultant and manufacturing executive Bob Burrows says that in a successful S&OP process, good analytics has a critical role to play.

Effective Manufacturing Analytics Requires Cross-Functional Data Sharing

by Malcolm Wheatley

In many manufacturing companies, a process known as Sales & Operations Planning (S&OP) aims to tie together sales forecasts, manufacturing plans, raw material purchases and inventory management. The logic is simple: figure out what customers are likely to want to buy, make it, and then sell it to them when they knock on the door.

The problem? In almost as many manufacturing companies, executives will readily point to a litany of S&OP failures: poor forecasts, lack of coordination between sales and production, turf wars, excessive inventory and a lack of responsiveness. In short, goes the received wisdom among analysts, academics and industry insiders alike, S&OP is a good idea that is often let down by sloppy execution.

In a just-published book entitled *The Market-Driven Supply Chain*, longtime supply chain consultant and manufacturing executive Bob Burrows looks at what goes wrong with manufacturers' S&OP processes, and sketches out what he terms "the seven guiding principles of the design of a market-savvy S&OP".

The bottom line: In a successful S&OP process, good analytics has a critical role to play. And the other day, I sat down with Burrows to discover how.

Data Informed: Where do manufacturers go wrong with S&OP?

Bob Burrows: They treat customers as a single homogenous group, with very little attempt to segment them by metrics that actually matter. For example, they segment them by factors such as size or geography, but not by how they use the product—which can have a significant impact on demand, and on demand predictability. In other words, they collect an enormous amount of data, but fail to put it in context.

DI: So how can analytics provide that context? What should companies do differently?

Burrows: You have to start with the fact that usually there isn't a clear-cut way of distributing data around the organization in a way that helps people to communicate

what it means. The distribution function talks about SKUs and warehouses; manufacturing talks about production lines; sales people talk about territories and regions. There's a lot of analysis going on, but it's all within functions.

In the book, I describe how Goodyear used S&OP to enable manufacturing and the sales and marketing function to communicate more effectively. Goodyear had production lines that were very lean and efficient, having made extensive investments in techniques such as Six Sigma. But the result was that they were very efficiently making a lot of tires that no one was buying. Manufacturing would call up marketing after an S&OP meeting to ask: "Why are you not selling what we are making?"

Today, taking tires sold to Wal-Mart as an example, output is precisely tailored to the demand coming from individual Wal-Mart stores, which get deliveries once or twice a day via a nationwide network of specialist tire distributors, rather than Wal-Mart's own distribution network. The production lines are slightly less efficient, but there's virtually no finished goods inventory. It's a savings of millions of dollars.

DI: How can manufacturers move forward to get to such insights? How do you start building an S&OP process that's fit-for-purpose?

Burrows: You start by assembling a group of cross-functional people from each relevant part of the business, as any description of S&OP will tell you. But—and here's the difference—they must look at the data using the language that the customer speaks, and not how they would look at that same data from within their individual functions.

Which group of customers is buying? What are they buying? Where are they buying it? Why are they buying it? Don't forecast or analyze by brand, but instead use whatever imperatives drive the customer's thought processes. In short, how does the customer think? And then map that thinking onto your own processes.

As an example, we found that for a medical device manufacturer producing instruments for operating theatres, analyzing and forecasting by type of operation gave a better result than analyzing and forecasting by type of device.

DI: In the book, there's a chapter entitled 'Managing By Analytics', that begins with a discussion of effective S&OP teams. Why that focus on team work, in a chapter on analytics?

Burrows: Because most S&OP teams aren't proper teams, and aren't effective. Teams work best when analytics rule the discussion. Yet we often find S&OP meetings being run by one department, or dominated by sales lore or historical conventions that go unchallenged, but which drive decision making almost unwittingly.

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As I say in the book, when a meeting relies on subjectivity and the opinions of the most articulate, when the less-demonstrative participants are not encouraged to have a voice, and when bias and prejudices dominate, it is not a team meeting. The meeting is a power struggle, and the power of the team is lost. A strong team culture calls out these issues and insists on analytics.

7 Characteristics of Proper Analytics

In his book, "*The Market-Driven Supply Chain*," Bob Burrows identifies seven qualities of good analytics.

1. Cross-functional
2. 'Big picture'
3. Relevant
4. Understandable
5. Provides perspective
6. Passes the "so what" test
7. Validated

DI: In the book you talk about the 'seven characteristics of a proper analytic" in an S&OP context. Tell us more.

Burrows: Most people don't have any idea of what a good analytic is. They are using statistics as a tool for describing data, and not as a tool for informing action. In other words, they aren't trying to get the data to tell them a story about what will happen—they're just describing what has happened in the past. Which isn't the point. As a result, many analyses are simply a total waste of time in preparation and presentation, because they don't tell a relevant story.

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How UPS Trains Front-Line Workers to Use Predictive Analytics

by Elana Varon

UPS provides its truck drivers and front-line workers training on how to benefit from predictive analytics and why it's important to the business.

Jack Levis of UPS

The payoff from investments in predictive and prescriptive analytics comes when front-line workers use the findings to make better business decisions. Companies that hire data scientists to seek new patterns in corporate data also need a workforce with a deeper knowledge of statistics—people who can act on the results.

"You have to understand how to interpret the answers," says Jack Levis, director of process management with United Parcel Service. Levis is rolling out an initiative, On Road Integrated Optimization and Navigation (ORION), that crunches business rules, map data, customer information, and employee work rules, among other factors, to optimize package delivery routes.

When fully deployed, the system will offer more than 55,000 front-line supervisors and drivers the tools to test scenarios and make tradeoffs. To reach a performance objective, is it better to save a mile of driving? Or to make a premium delivery 15 minutes early?

Neither the managers nor the drivers are expert data analysts, nor do they need to be. UPS provides role-based training that teaches employees how to use ORION and what's behind the results it generates. "They need to understand, if I change this parameter, this is what the answer is going to be," says Levis. They also need to recognize when—and why—the software gives an answer that doesn't make sense.

"The skills you need that were exclusive to analysts are being pushed down further and further to the front lines," observes Thilini Ariyachandra, associate professor of MIS at Xavier University Williams College of Business in Cincinnati. But today's workers may not have an academic background in math, statistics, or analytics to fall back on. Meanwhile, improving data literacy—the ability to understand and learn from data—requires practical business experience.

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Teach Them About Data

Most front-line employees don't use analytics today, says Tony Cosentino, vice president and research director with Ventana Research. Even executives aren't inclined to dive into corporate data. "They're going to their analysts to present them with the story lines," he says.

But data professionals and corporate executives alike expect that to change as companies attempt to reap the benefits of advanced analytics. Not everyone will need to know lots of math or statistics, Cosentino says. But managers, for example, will need to know what a regression or a cluster analysis is supposed to tell them.

In 2012, Ventana surveyed more than 2,600 organizations about their use of analytics: two-thirds of respondents were already using predictive analytics to at least some degree.

However, fewer than half of the organizations reported providing adequate training for users in three key areas: analytics concepts and techniques, application to business problems, and use of technology.

Cosentino says he expects companies will start to identify the analytics skills they are missing and develop online training tools for employees that are aligned with their career development.

Universities, meanwhile, are incorporating business intelligence and analytics training more broadly into the business school curriculum in subject specialties outside of MIS such as finance or marketing. At Xavier, even business minors get exposure to BI through introductory courses, says Ariyachandra. One of the biggest challenges for universities, she adds, is giving students real-world experience. Employers want students to have internships, or to have worked with real business data. But creating partnerships with companies that will hire students, provide datasets for analysis, or offer access to their tools isn't easy.

Yet the business context is critical. Writing in the American Society for Quality's *Six Sigma Forum Magazine* last August, Peter Sherman, director of process excellence with Cbeyond, suggested companies should not only train workers in how to use data, but also provide them with coaching from subject matter experts in how to interpret it.

That coaching is a main theme in the UPS effort. "You have to be able to relate it back to something that they already know," says Warren Charest, a UPS project manager who was part of the team that created materials used to train employees on ORION. When teaching front-line managers how to use the software, "we take miles as something to explain the algorithm. If you reduce miles, you save money," he says. "People understand that and they start asking questions."

Drivers train on the road., but computers in every building graphically display their routes. Supervisors can break down the route into sections and show the driver how the

algorithm is deriving it. Drivers can be skeptical about ORION's value compared to their own knowledge of their routes, but those who embrace it are challenged to use their experience to beat it.

Over a few months, one driver used feedback from the system to cut more than 30 miles from his regular route. "The better they understand how the tool is finding an opportunity, the better we do as an organization," Charest says.

Refining Data Views to Hide the Math

UPS deployed ORION at its first location in 2008 and is expanding the rollout this year. An early version presented managers with too many variables to manipulate; it was difficult for them to learn how the variables all played off of each other, Charest says. In later versions, developers wrote software that eliminated any variables that could be calculated behind the scenes, leaving managers only with those that required their input.

"A lot of people try to put too much in front of people all at once," says Charest, a college math major who started his career at UPS loading trailers and worked for a time in industrial engineering. If managers want to dig deeper, they can ask engineers to run an advanced analysis, "but you're not going to train the front-line supervisors" to do it.

Lessons from UPS Training

- Tell users how using analytics helps them meet performance objectives. For example, saving money by cutting miles traveled.

- Relate data findings to workers' existing practices. Explaining graphical displays of truck routes challenged drivers to beat the machine.

- Too much information can overwhelm. Refine data displays to what's important to front-line workers and offer access to deeper dives on request.

- Remember smartphones and other consumer technologies are making workers (especially younger ones) more comfortable with data displays.

UPS developed ORION in-house. But vendors are starting to offer tools that, similarly, hide the math, says Cosentino. That means line managers will find it easier to do predictive analytics without having to do a lot of computation.

The march of consumer technology, meanwhile, is helping workers to become more comfortable with data, suggests Charest. "When I started 21 years ago, I had one friend who had a cell phone. Now people are used to dealing with big piles of data because we have so much through social networking."

Says Cosentino: "The tools, married with, hopefully, the interdisciplinary mind of millennials, will help solve this."

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Driving operational excellence
with predictive analytics

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Introduction

Imagine a smarter planet where companies can profitably streamline their operational processes to meet ever-changing customer demands. Imagine not only optimizing your production and distribution channels, but also ensuring you hire and retain the right employees, who create the right product or service and deliver it at the right time. Imagine the impact of your processes being able to withstand short-term stresses or unexpected changes in the marketplace, rather than being rigid and based on long-term planning. Imagine your operational processes being a major source of your organization's competitive advantage.

- 74 percent of best-in-class corporations, rated by Aberdeen Group, stated that their top strategic action was to "improve the efficiency of manufacturing operations."[1]

- Toyota Motor Corp. paid approximately $4.2 billion in warranty claims in 2010.[2]

- Warranty-related expenses can amount to anywhere from .5 percent to 7 percent of product revenue for large companies.[3]

- Sales margins at retailers can diminish anywhere from 5-15 percent with poor assortment planning processes.[4]

- For every dollar collected as premium, insurers spend 13 cents on claims expenses and 61 cents as claims payouts.[5]

- The cost of claims payouts and expenses is the largest spending category for a property and casualty insurer, often times accounting for up to 80 percent of premium revenues.[6]

- Employee turnover costs organizations anywhere between 25 percent and 250 percent of the exiting employee's annual salary. Entry-level, unskilled positions are at the lower end of the cost range, while executive, managerial and sales positions are at the higher end.[7]

Due to relatively affordable advances in technology, from radio frequency identifiers to sensors to social media, we can now collect, store and analyze information like never before. We are more interconnected, instrumented and intelligent than in any other time in human history, and this smarter planet provides companies with new operational opportunities.

Organizations will only gain from those opportunities if they are able to manage the increasing complexity that surrounds us.[8] Not only are new opportunities emerging in rapidly developing markets, new customer segments are differentiating themselves in mature markets. Adding to the pressure is rapid fragmentation. The world may be flat, but it is now made up of discrete markets, proliferating product and service categories and individualized customer segments. Organizations unprepared to act immediately on these new opportunities may watch them slip away almost as quickly as they emerge.

While rising complexity may sound threatening at first, reframing that initial reaction is fundamentally important. Successful CEOs refashion their organizations, making them faster, more flexible and capable of using complexity to their advantage.

So how does an organization balance a rapidly changing marketplace against its internal capabilities?

"When things look very simple, you need to look for a competitive edge. When things are complex, you simplify to get the competitive advantage."

Graeme Liebelt, Managing Director and CEO, Orica Limited

The days of working smarter have arrived, and the key lies in operational dexterity or agility, which is crucial to ensuring operational excellence. Your organization must respond more quickly by making changes faster—and keep the operational processes of your company flexible, yet ensure they remain efficient and profitable. An operationally excellent company ensures that all of the internal people, assets and processes are aligned and optimized to deliver the exact product or service that meets customers' needs. An agile corporation also modifies their operations proactively to ensure that potential operational issues are prevented and future customer needs are met.

The goal of operational dexterity is to not only to meet your customers' needs, but also utilize it as a competitive advantage. But where do you start?

In this paper we will focus on how to enhance operational agility through predictive analytics technology, and provide you with the steps for doing so. We will also provide examples of how leading organizations are applying IBM SPSS predictive analytics solutions to:

- Manage their physical and virtual assets.
- Maintain their infrastructure and capital equipment.
- Maximize the efficiency of their people, processes and assets.

Some specific solutions include claims management in insurance, demand forecasting in energy and utilities, product optimization in automotive and quality improvement in consulting—though there are many more. As a result of using IBM SPSS Solutions for Predictive Operational Analytics, companies can increase efficiency and productivity, reduce costs, increase profitability, enhance customer satisfaction and become more competitive.

The need for smarter operations

Based on an IBM survey of over 400 supply chain executives in over 25 countries and 29 industries,[10] the five major challenges that they face are in cost containment, risk, globalization, customer intimacy and visibility. The biggest challenge, stated by more than 70 percent of executives, was visibility. They don't have the appropriate level of insight into what is happening within their operations on the ground-level or on the production floor in real time, and this lack of insight hampers their ability to make the right decisions at the right time.

To increase that visibility, operations must be smarter and effectively leverage all available information to make the right decision at the point of impact. The need to be smarter about operations is even more evident in today's times. Based on a McKinsey Global Survey,[11] almost 75 percent of executives surveyed stated that they first turn to operations to begin cutting business costs. So operations departments are struggling to do more with less—and that isn't likely to be changing soon.

Instead, organizations must become smarter in their operations to retain customers. Numerous companies are turning to predictive analytics to evaluate their internal workings and adapt operations. Predictive analytics enables companies to strike the right balance between operational cost, speed, flexibility and quality. According to the global supply chain study noted earlier, 48 percent of product companies identify improving quality as a key challenge. For most, balancing the operational levers is a juggling act: the cost for your product or service needs to be as low as possible, yet quality must be high and you need to bring the product or service to market quickly. And, of course, your operations must be flexible enough to modify the product or service if needed. In order for decision makers to ensure that your company is meeting customers' ever changing wants and needs, this balance must be optimized in real-time by using all available information. That means not only understanding what has happened in the past, but being able to look forward and anticipate what may occur in the future, so you can modify your operations accordingly.

Predictive analytics can significantly maximize efficiency, productivity and profits. It provides you with access to fact-driven predictive insights in real-time, driven by your organizations' specific needs.

The Operational Value Cycle

Today's dynamic environment requires a systematic approach to managing your operations. By using predictive analytics throughout your decision-making lifecycle, you can continuously refine the decisions you make and the strategies that you use as an organization to make decisions that are based on insight.

Being smarter means moving away from a broad long-term planning approach and instead becoming more agile in your ability to respond to each customer—this is operational excellence. Agility allows an organization to become operationally excellent by focusing on the intricacies that a business faces on a daily basis.

In Figure 1, you can see the lifecycle of interactions which a product or service has with its organization. The progression is natural. For example, if your company is product-focused, you plan to create a product and purchase raw materials. Those raw materials are then mixed with other materials or assembled with other parts to create a product. The product is then delivered to your customers. Finally, support is provided to customers for purchasing and using the product. If, for example, you are a consulting firm, the "product" would be an employee, who is hired, trained and finally sent out to the field to deliver additional support.
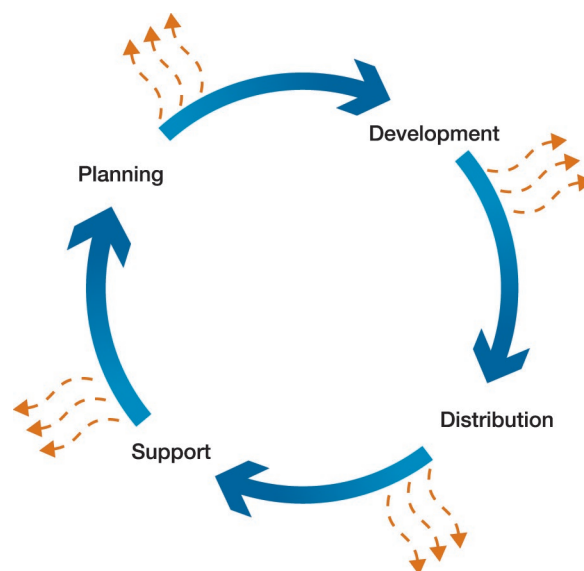

Figure 1: The Operational Value Cycle.

As the product or service moves through the cycle, its value increases at each point. However, a loss of value may also occur at any point, whether a product is scrapped due to quality concerns, returned from the field, or modified and replaced within existing inventory. Money is likely lost, or additional funds are required to reintroduce that specific part or service back into the value cycle. In order for an organization to profit, its operations team must understand how to mitigate these losses whenever possible.

Operational excellence: efficiency is everyone's business

Operational excellence means that each product or service throughout each stage of this value cycle not only increases its value, but increases it in an optimal way for the organization. The business processes and interaction points are flexible enough to take into account the unique influences of customer behavior. Operations must ensure that your employees and processes are efficient enough to be modified in real-time to maximize not only output, but also profit.

Below you can see the relationship between the product and various business functions within an organization.
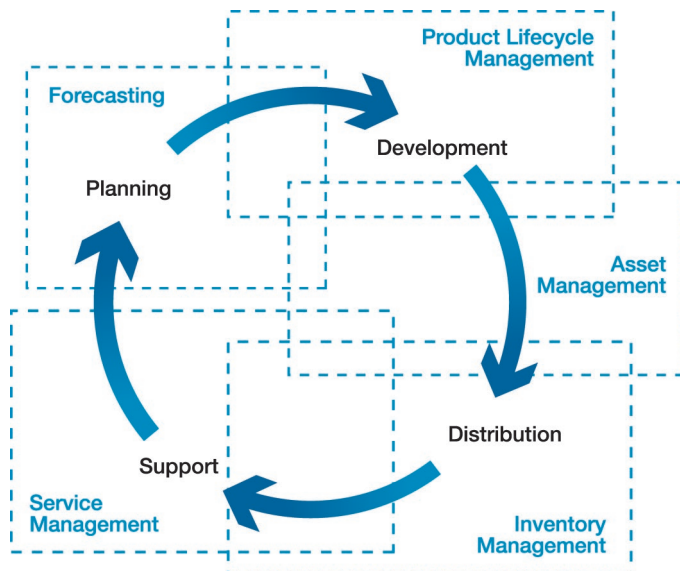
Figure 2: Operational excellence is an organizational effort.

Product lifecycle management, asset management, inventory management, service management and forecasting are all functions that interact with almost every part of the business, from research and development to finance and sales. Each department plays a role in driving operational excellence.

Predictive analytics fits in every aspect of the operational value lifecycle. As you can see, the cycle is continuous: as you acquire new data or feedback from the customer, you analyze it, and learn from it. The insights you gain then help you improve your policies and parameters regarding planning, development, distribution and support—enabling your organization to constantly improve its operations.

Better understand and control your operations with predictive analytics

Predictive analytics allows organizations to squeeze costs out of their operations and ensure that their operations are streamlined and efficient.

With IBM SPSS Solutions for Predictive Operational Analytics, your company is able to better:

- Manage your physical and virtual assets—from identifying the right physical inventory to stock in your multi-tier supply chain to assessing how many components to purchase to support your production facilities.
- Maintain your physical infrastructure and capital equipment—set optimal maintenance schedules to reduce downtime and receive alerts about any imminent failures.
- Maximize your capital—ensure you are allocating your people and cash in the most efficient manner, in the context of your business processes.

Mastering predictive analytics is a journey that starts with using the information that you have to find insights, and continues through determining the next best action for a particular situation or decision maker. Predictive analytics allows organizations to analyze their historical and current data to determine likely future outcomes. Having the answers ahead of time gives you the ability to control what action you take and when, so that you can plan and implement. Without analytics, you react only when an issue has been identified and usually has caused a problem. This can cost your organization, in terms of lost revenue, lost market share, reduced credibility with your employees or customers and even bankruptcy.

A proactive approach to operational excellence begins with analyses of all information that organizations gather. When using IBM SPSS predictive analytics solutions that information could be in structured formats, such as inventory information, production line information and financial information as well as unstructured formats, such as maintenance and production logs, social media content and employee surveys.

Predictive analytics integrates data from various sources and utilizes sophisticated data mining techniques to determine patterns from the data. Business rules, specific to your own organization, can also be included to optimize the outcomes from the predictive models. The outcomes are given proba-bility likelihoods. Decisions can be assigned to the outcomes and deployed to the organization via email, dashboards, scorecards or reports. Once a decision is made, there is a response to the decision, and that acts as another data point. As the data gets updated, the predictive models are refined, providing improved processes, outcomes and decisions.

IBM SPSS Solutions for Predictive Operational Analytics can improve operations in almost any industry segment, from manufacturing to banking, retail to health care. They also work equally well for small to mid-sized companies or a global enterprise.

Let's look at some of the areas in which predictive operational analytics have been particularly effective.

Efficient and accurate claims processing

Infinity Property & Casualty Insurance wanted to improve and automate its process for identifying fraudulent claims, both to make better use of its investigative staff and also to pay legitimate claims more quickly. The company also wanted to overhaul its outsourced subrogation process, which was costly, very high-touch, overly reliant on human judgment and produced low restitution rates.

Infinity Property & Casualty implemented IBM SPSS predictive analytics solutions, immediately realizing significant benefit in terms of a reduction in claims payments and improved customer service. "I was looking for a product for the enterprise, one that we could use for a variety of predictive analytics. Primarily, I was interested in speeding the settlement of claims that did not contain elements of fraud. The IBM SPSS solution was the clear winner in meeting all of our requirements," said Bill Dibble, SVP Claims Operations.

Automated data analysis and workflow identify claims most likely to be fraudulent and expedite the settlement of legitimate claims, improving customer satisfaction and loyalty while reducing third-party collection fees.

> *"With predictive analytics we were basically able to close a hole in our pocket where money was leaking out steadily."*
>
> Bill Dibble, SVP Claims Operations, Infinity Property & Casualty Insurance

Since using the IBM SPSS solution, the company received a 400 percent return on investment (ROI) from the implementation of the claims management process and an increase of $12 million in subrogation recoveries. Infinity has also boosted its accuracy in identifying fraudulent claims from 50 percent to 88 percent, adding $1 million to its bottom line by eliminating about $70,000 per month in third-party collection fees. The referral time to send those claims to Infinity's Special Investigative Unit has gone from 45–60 days down to one to three days.

Demand forecasting and planning

IBM SPSS predictive analytics solutions help energy and utilities companies optimize their operations for a wide range of functional areas, providing significant benefits for revenue loss management, load management, outage management, asset management, risk management and energy management.

Through the advanced capabilities of predictive analytics, these organizations can predict future energy demand, optimize rates and pricing programs, better plan for power purchases, foresee the availability of excess energy and gauge the likelihood and location of power outages. In addition to these operational benefits, predictive analytics also provides actionable insights into the changing demands, preferences and behaviors of energy consumers.

For example, CIPCO, Iowa's largest cooperative energy provider, needed to move beyond the limitations of its Microsoft® Excel-based solution to analyze a wide variety of issues. By implementing IBM SPSS technology, CIPCO is now able to continuously monitor and perform analyses on the state of its energy grid in order to optimize prices, extend staffing resources and make better informed investment decisions.

The IBM SPSS technology has improved CIPCO's profitability, enabled better power purchasing decisions and provided an easy-to-understand view of dynamic pricing data to drive greater business success. According to Lisa Sell, CIPCO's energy planning manager, "If we had stayed with Excel, we would be paralyzed by the mass of data. The IBM SPSS solution gives us the power and flexibility to keep track of everything, with very little manual manipulation."

Improving the quality of products and services

As a premium manufacturer, The BMW Group aims to win customers over with innovative, original designs and quality, so it's essential for the company to continually evaluate and assess its products and services and take customers' opinions on board. The company's previous product design and quality processes for collecting data was fragmented, so decision makers couldn't get an integrated view of the data.

Since using IBM SPSS predictive analytics software, The BMW Group has been better able to efficiently manage and analyze vast quantities of data, including data on vehicles and repairs, vehicle error, dealer feedback and more. Doing so enables the company to identify the relationships between product and process data, and their effects on quality. What sets this solution apart is the fact that data is no longer considered in isolation, but in combination, providing completely new insights.

The results of the analyses are immediately channeled back into BMW's working processes and to a wide circle of users, helping to reduce error rates and save costs—in real time. "In general, it's about making various processes transparent. Success can then be measured wherever data is generated. The longer term goal is, of course, to improve BMW's performance in all areas and thus further consolidate its success," explains Michael Unger, Key Account Manager of Predictive Analytics at IBM SPSS in Germany.

As a result of continually improving its products and services, BMW boosts customer satisfaction and consolidates its position as one of the most successful players in its market.

Reviewing and processing electronic documents

Law firms and their clients needed to find a more efficient way to review the massive volume of electronic documents produced during the discovery phase of a law suit, thus reducing the overall cost of litigation.

CAAS LLC, a company based in New York and Washington D.C. that provides technology solutions and consulting services to law firms, law enforcement agencies and other clients, recognized this challenge. CAAS combined IBM SPSS predictive and text analytics with domain expertise and industry best practices to create a solution that helps lawyers review millions of documents in minutes, identify duplicates, and dramatically reduce the cost of e-discovery.

Rather than sifting through thousands of documents in no particular order, law firms employ sophisticated text analytics tools to rapidly sort the document pile into groups of nearly identical documents, helping attorneys complete the review process in a fraction of the time and at significantly less cost.

As a result, average e-discovery costs were reduced by 30 to 70 percent. "With IBM SPSS predictive analytics, we're really cutting a lot of cost, increasing accuracy and reducing the time it takes to do a review. It's a home-run application," said Gerard J. Britton, Director of Investigative and Compliance Services at CAAS LLC.
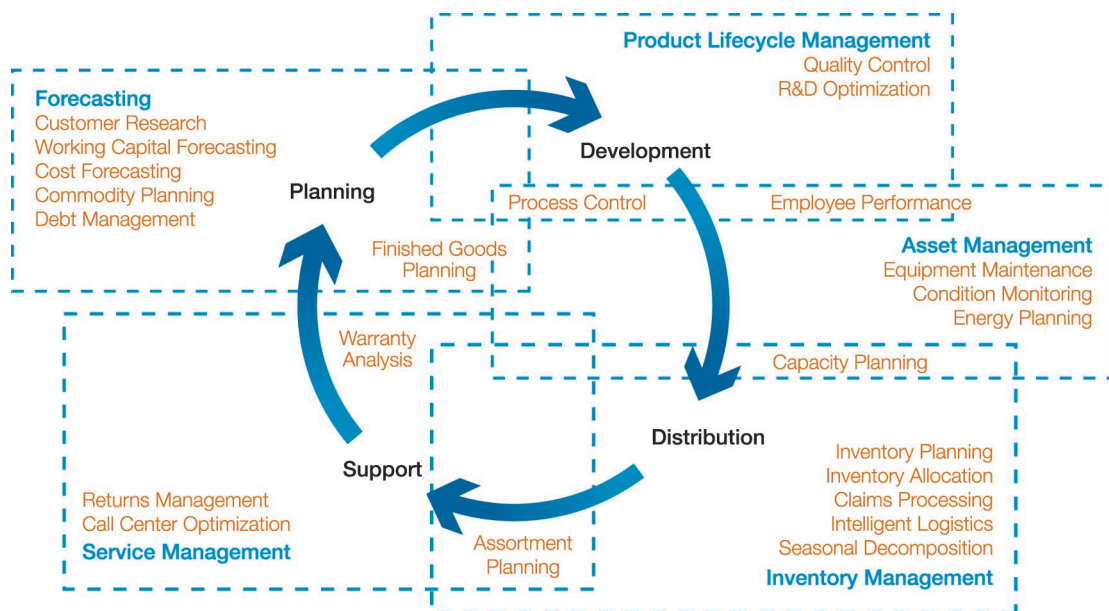
Figure 3: You can use IBM SPSS Solutions for Predictive Operational Analytics to improve operations in several areas.

Additional applications

As seen in Figure 3, there are numerous predictive solutions to help you with your operational needs, regardless of your functional area.

Additional examples of these solutions include:

Employee performance

As the population ages, many companies may find certain employee skills are diminishing. Employers can use IBM SPSS predictive analytics solutions to analyze the personnel data you already collect and identify high-value employees who may be at risk of leaving.

By analyzing both structured and text data such as work records, survey data, demographics and other information, employers can develop a predictive attrition model that identifies those workers most at risk of leaving. What's more, IBM SPSS predictive analytics solutions also help employers determine specific actions they can take to help persuade the employee to remain with the company.

Predictive maintenance
Many automotive manufacturers currently face high costs associated with downtime for unscheduled machine maintenance, which can lead to unfilled orders and lost profitability. By using IBM SPSS Solutions for Predictive Operational Analytics to examine all repair, usage and downtime data, your company can predict with a high degree of accuracy which machines are most likely to fail or need service. Armed with this analysis, you can schedule maintenance or repairs before they become a downtime incident—saving money while maintaining a steady production output level.

Assortment planning
To maximize the chance that consumers will find the product that they want just when they need it, retailers need to analyze millions of data points and share consolidated information throughout their supply chains.

One major auto parts retailer used IBM SPSS predictive analytics software to combine the best planning rules of its category managers with the forecasting accuracy only statistical modeling can provide. Now the retailer creates sales forecasts for every one of its products and can optimize the product mix at all of its stores. The product placement accuracy rate increased from 40 to 70 percent thanks to greater supply chain accuracy, while inventory carrying costs declined significantly.

Customer research
Not-for-profit organization FDB needed a way to parse and categorize huge volumes of unstructured data from its ongoing survey of Danish food consumption patterns, which already includes information on 300,000 meals from a representative sample of the population.

By using IBM SPSS predictive and text analytics, the organization was able to rapidly categorize and analyze online survey responses from 52,000 consumers per year, without having to read text responses word for word. The survey responses connect consumption behavior with data on purchasing habits, creating new knowledge and commercial opportunities.

Take the next best action

As noted in the examples above, companies of all types are coming to rely on predictive analytics as an effective technology. While usage and adoption may vary from the enterprise level to the departmental level, those moving toward a consistent, controlled approach to managing operations are experiencing significant ROI and benefits.

Organizations typically take one of two approaches to the adoption and use of predictive analytics. Providing insight for decision makers is the top priority for many businesses, and in such cases advanced analytic techniques help to paint a clear picture of what is happening and why. Other companies want to move beyond insight to actually identify the next best action in a critical process—such as determining whether an employee needs an incentive to stay, whether an insurance claim should be sent to the special investigations unit or what to price energy at a certain time.

Our experience shows that organizations grow in analytics maturity step by step. Many have some type of reporting or analytical technologies in place but then find that these technologies don't adequately address critical business challenges. This realization moves the organization to take steps toward becoming more analytically mature through the use of predictive analytics, which enhances decision-making abilities. Organizations that make this leap are able to differentiate themselves by improving processes and proactively managing their understanding of and responses to operational challenges. We can describe these organizations as "masters"—that is, they are using predictive analytics in sophisticated, innovative ways to protect themselves from major errors and using the data they have to their best advantage in their decision making.

The most advanced organizations, such as Infinity Property and Casualty Corporation and CIPCO, practice information-based decision making to help them achieve operational excellence. Decisions are made in real time based on the data that is available: what is the next best action, based on the information I have? How should I allocate my resources? And how can I automate the decision-making process so that it takes place at the point of interaction?

Organizations at this level are using their knowledge of what has happened in the past to predict what is likely to occur in the future, and applying that insight to build strategies which enable them to optimize their processes and respond appropriately in real time.

Adoption of predictive analytics for operational analytics can also help your organization succeed with other critical strategies that are often related, such as customer intimacy and threat and risk management. For example, when Infinity Property & Casualty deployed predictive analytics to boost the accuracy of claims processing, it also experienced significant increases in customer satisfaction. Because the entire claims process was more efficient, legitimate claims submitted by low-risk policy holders could be processed and settled quickly, while suspect claims were flagged for special handling and given the time and attention required to determine whether or not fraud was a factor.

Although you may be at a different stage of adoption, achieving operational excellence is a realistic target if you approach it with a solid understanding of how you are currently using data to manage operations, and the steps needed to get to your ideal level.

Four steps to creating operational excellence

Ultimately, for organizations to manage operations in today's intelligent, instrumented and interconnected world, they need to look at how to apply predictive analytics at the point of interaction, where real-time, pattern-based strategies merge with situational context. This level of transformation requires a series of changes in how an enterprise manages information and how it applies that information to achieve its goals.

IBM can work with you to create a road map that includes a series of incremental steps designed to move you towards your operational goals. We recommend that before you make any decisions concerning specific technologies or solutions, you should be able to answer some critical questions about your organization's current strategy and use of enterprise data:

1. *Determine your organization's current operations strategy.* Identify your approach to operations, both as an enterprise and in key areas such as finance, production or customer service, and the types of actions you are currently taking to reduce operational risks within your processes. Would you describe yourself as reactive, proactive or somewhere in between, depending on the situation or opportunity? How advanced would you like to be in your use of predictive analytics? How are you using analytics to define the parameters of your policies? Is this process dynamic, enabling you to modify policies as conditions change?

2. *Examine your data collection methods and determine how those metrics are or could be aligned with departmental or corporate metrics.* Determine how data is used within the company by different departments. What data are you collecting and how is the data being used today? When is it used? How is it consolidated? How easily can you attain insights from your data? How much of your data is based on textual or unstructured information? Are you analyzing social media data? Are you only leveraging historical data?

3. *Determine your current capabilities versus your needs or wants. Examine how you are using predictive analytics today.* Where are you using it, and how? What types of results have you experienced? Are you accurately recognizing challenges and opportunities to your operations, and taking preventive measures to cope efficiently with risks? How are you monitoring the activity that is taking place today? Do you have different levels of decision makers, such as line of business managers and executives? Do they have access to easy-to-understand predictive dashboards?

4. *Identify opportunities for automation and control.* Do you have processes or decisions that can be easily automated, if they aren't already? How much manual work currently exists, and how many resources are committed to it? Can any decisions be made in real time?

Your responses to these questions will help you begin to identify the areas in which you can start achieving real, incremental results that will benefit your organization.

IBM SPSS solutions: Driving actionable insights

IBM offers you the ability to build upon your existing environment to achieve better business outcomes. We offer a full range of tools, all built on open standards, which you can use as needed to take the next steps in your journey toward achieving operational excellence using predictive analytics.

IBM SPSS predictive analytics solutions help organizations drive optimal outcomes in three core areas that are essential for business success: operational analytics, customer analytics and analytics for threat and risk. Each area focuses on the organizational realities businesses face when optimizing data to gain operational insights and improve critical business functions.

Through solutions such as IBM® SPSS® Statistics, IBM SPSS Modeler, IBM SPSS Data Collection and IBM SPSS Decision Management, people from all over your organization can gain more insight, make better decisions and take more decisive actions when they matter most. These solutions form a comprehensive, unified platform that works smoothly to deliver insight to your decision makers. Key capabilities are tightly integrated, and you can build or add capabilities as you need to. All of these software products use open, industry-standard technologies that allow for information to be transmitted and shared securely and efficiently.

You can also enhance and augment your IBM SPSS predictive analytics solutions with complementary technologies from the IBM Business Analytics software portfolio, such as IBM Cognos® Business Intelligence and financial performance software and IBM Maximo® asset management software.

Conclusion

IBM SPSS Solutions for Predictive Operational Analytics are designed to meet you where you are and provide value. They enable you to:

- Manage your physical and virtual assets—from identifying the right physical inventory to stock in your multi-tier supply chain to assessing how many components to purchase to support your production facilities.
- Maintain your physical infrastructure and capital equipment—set optimal maintenance schedules to reduce downtime and receive alerts about any imminent failures.
- Maximize your capital—ensure you are allocating your people and cash in the most efficient manner, in the context of your business processes.

The most forward-thinking organizations are turning to predictive analytics as a proactive approach to improving operational agility because it empowers them to:

- Increase efficiency
- Improve productivity
- Reduce costs
- Increase profitability
- Enhance customer and employee satisfaction
- Become more competitive in the marketplace

Companies like yours approach their use of predictive analytics as something which impacts the entire organization. Our solutions provide value to senior management by giving them visibility into what will happen in their operations via key performance predictors, usually displayed in interactive dashboards, reports and alerts. Our software helps line managers and policy makers define how operations will work through highly accurate forecasts and business focused optimization. Decision makers see what will happen in the operations they manage. Our solutions also help individual contributors take the next best action.

With predictive analytics, your organization can find a way to gain a deeper understanding of your operations and use that understanding to develop proactive resolutions to the challenges you face every day.

About IBM Business Analytics

IBM Business Analytics software delivers data-driven insights that help organizations work smarter and outperform their peers. This comprehensive portfolio includes solutions for business intelligence, predictive analytics and decision management, performance management and risk management.

Business Analytics solutions enable companies to identify and visualize trends and patterns in such areas as customer analytics that can have a profound effect on business performance. They can compare scenarios; anticipate potential threats and opportunities; better plan, budget and forecast resources; balance risks against expected returns and work to meet regulatory requirements. By making analytics widely available, organizations can align tactical and strategic decision making to achieve business goals. For more information, see **ibm.com**/business-analytics.

Request a call

To request a call or to ask a question, go to **ibm.com**/business-analytics/contactus. An IBM representative will respond to your enquiry within two business days.

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Please Recycle

Car manufacturer strengthens its competitive position with IBM SPSS

IBM SPSS data mining helps optimise the quality of premium passenger vehicles

Overview

Business challenge
The BMW Group needed to be able to manage and analyse the large volumes of data generated by on-board diagnostics tools, handler feedback and repair reports so that it could continually improve processes.

Solution
By deploying IBM® SPSS® data and text mining software, the whole BMW Group benefits from a user-friendly solution that analyses data quickly and efficiently and displays the results in a user-friendly manner. The results are then available to a large community of users, even those who are not direct users of the SPSS software.

Using IBM SPSS data and text mining software, the BMW Group is able to analyse a wide range of information, including data on vehicles or repairs, faults recorded by vehicles' on-board diagnostics tools, and feedback from dealers. Rather than forcing users to consider such data in isolation, the innovative IBM solution enables cross-analysis with respect to a variety of factors, encouraging users to gain new insights. Learnings from these analyses are subsequently incorporated into ongoing operations and are used to reduce error rates and reduce costs. Thanks to ongoing improvement of the company's products and services, customer satisfaction is increased and BMW can extend its position as one of the world's most successful car manufacturers.

To uphold its reputation for innovative, original design and quality as a premium manufacturer, products and services as well as customer opinions and wishes must be continually evaluated and assessed. This is the reason BMW collects data on vehicles and repairs from the on-board diagnostics tools built into its automobiles, and from customer and dealer feedback. By analysing this information, BMW is able to develop best practices and incorporate them into its operations. This creates a continuous process of evaluation, analysis and improvement.

Correctly analysed data becomes a 'lifeline'

Data can be seen as the 'lifeblood' of a company and, especially in a globally active company such as the BMW group, fills gigabytes of disk space each day. The challenge is to manage the vast amount of information held in the company's databases. While the unsorted data is not very useful, with the correct analysis tools, it can quickly develop into a lifeline for the company. For example, with the aid of standard tools, employees who focus on quality control can keep track of the frequency of errors occurring for a specific vehicle and create results tables. The key statistic used in measuring product quality is the 'number of defects during the warranty period' (also known as FPG). A reduction in this number decreases the cost of eliminating errors and improves the overall quality of products, thus increasing customer satisfaction.

Business Benefits

- Enables comprehensive evaluation and assessment of products and services, customer opinions and suggestions for improvement.

- Records the frequency of quality-related errors associated with a specific vehicle. The key figure for measuring the product quality is the 'number of defects within the warranty period'.

- Identifies new correlations and trends through pattern recognition, as well as statistical and mathematical procedures.

- Creates an internal generic platform based on a service-oriented architecture, allowing other areas of the business to access data mining services. Tools are available to all of BMW under the name AVAQS (Advanced Quality System).

- Pulls in data for commonly asked queries in advance, making information available to users more quickly.

With the aid of traditional business intelligence methods, only simple analyses can be performed, such as the identification and weighting of selected component failures in vehicles, for example. As the volume of data increases, however, it becomes ever more difficult to manually filter out all possible irregularities from the data. In addition, standard BI tools cannot cross-link the data; they can only view it in isolation. With more than 30 million possible combinations, traditional Bl tools reach their limits in the detection of irregularities and correlations.

With IBM SPSS data and text mining software, however, BMW group gains a solution which not only quickly and efficiently analyses data and combines the results, but is also easy to use. The solution can run thousands of queries in a short period of time and enables the target-oriented analysis of large amounts of data. Based on pattern recognition as well as statistical and mathematical procedures, new correlations and trends can quickly and easily be discovered.

Internal platform saves time

A generic platform based on a service-oriented architecture (SOA) also allows other areas of BMW's business to utilise the data mining services. The IBM SPSS data mining tools are made available to all of BMW under the name AVAQS (Advanced Quality System). The advantage of this solution is primarily that complex analytical procedures can be transparently embedded in other applications. This makes the results accessible to a large number of recipients, even if the individual does not have direct access or knowledge of SPSS. The respective processes can be speeded up by days, without the user having to face a new application landscape.

A total of around 1,000 employees work with the AVAQS platform and use it for individual 'ad hoc' analyses. In addition, the company provides standardised analysis services. Here, specialists create analyses of certain questions in advance which are then made flexibly available to users on the platform.

Potential applications for data mining

A range of analytical functions can be performed with the solution. To take just one example: the repair service is critical for any manufacturer because customer satisfaction sinks with every repeat visit to a workshop. For a car manufacturer, it is especially important to understand how to enhance the repair service and avoid the need for repeat visits. Next to service and customer management processes, vehicle diagnostics represents a core element for employees in service stations worldwide to focus on. In vehicle diagnostics, IT-supported repairs play a central role. Thanks to the analysis of the repeat customer data – information about which sorts of repairs customers increasingly require at workshops – BMW obtained new findings that can be incorporated into development and production. Overall, the analysis was able to achieve significant improvements in the volume of repeat repairs required.

Solution Components

Software
- IBM® SPSS® Statistics
- IBM SPSS Modeler
- IBM SPSS Modeler Server
- IBM SPSS Collaboration and Deployment Services

Another way in which data mining is used at BMW is to analyse fuel consumption within individual vehicles. The data is transparently collected via cockpit instruments and every driver can view their own consumption data. In the case of internal test and prototype vehicles, the information is then collected and saved so that it is available for further analysis later on. For example, this enables analyses of different fuel consumption levels in various countries.

Since the deployment of the IBM SPSS analysis tools, BMW has seen a direct improvement to efficiency at its production plant in Landshut. During the casting process, Quality Control receives information on every single component through thermocouple sensors. Later, the quality of every cast part can be determined with the aid of a matrix code. This results in large amounts of production and quality data as well as parameters that are fed into AVAQS for analysis. This data is used to create statistical models. The goal is to quickly recognise any errors in the production process and to react with countermeasures. By exposing 'hidden information' in this way, improvement measures can be carried out sooner to increase the product quality.

"Generally speaking, it is a question of making various processes transparent. Where data is generated, success becomes measurable. The long-term goal is, of course, to improve the performance of BMW in all sectors and thus to achieve more success," according to Michael Unger, Key Account Manager of Predictive Analytics at IBM SPSS in Germany.

About IBM Business Analytics

IBM Business Analytics software delivers actionable insights decision-makers need to achieve better business performance. IBM offers a comprehensive, unified portfolio of business intelligence, predictive and advanced analytics, financial performance and strategy management, governance, risk and compliance and analytic applications.

With IBM software, companies can spot trends, patterns and anomalies, compare "what if" scenarios, predict potential threats and opportunities, identify and manage key business risks and plan, budget and forecast resources. With these deep analytic capabilities our customers around the world can better understand, anticipate and shape business outcomes.

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